A Review oneffects of Wire Electrical Discharge Machining process

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ABSTRACT

Wire-cut electrical discharge machining (WEDM) is one of the most non- traditional manufacturing processes for attaining high precision while machining hard materials and complex shapes which are impossible with traditional machining methods. This paper review the fine surface of the work, control over the wire tension, to overcome the corner error,detection of instability and wire breakage during process and prediction of performance characteristic of WEDM on various materials.This paper also reviews the effects of various WEDM process flow rateparameters such as pulse on time, pulse off time, servo voltage, peak current, dielectric, wire speed, wire tension on different process response parameters such as material removal rate (MRR), surface roughness (Ra).

INTRODUCTION

Wire-cutEDM machines is an excellent machining processes to achieve required shape. The material removal takes place by a series of spark producing between the electrode and work piece is shown in Fig no. 1. The work pieceand wire is immersed inside the electrically non conducting solution (dielectric fluid).these dielectric fluid used to remove the heat from the work piece. The material of the work piece should be electrically conductive one. Duringmachiningprocess, nodirect contact between the work piece and wire. Due to discrete electrical charge the material is eroded. Variousoptimizations and modeling method proposed by different researcher also discussed.

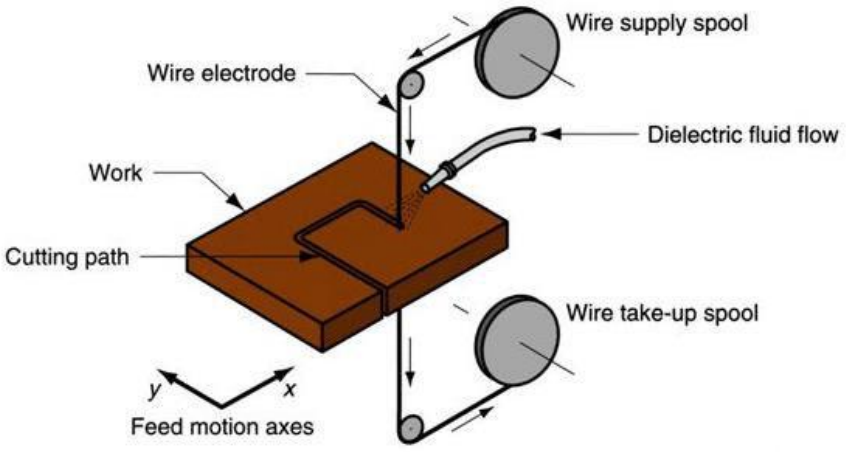

Fig no. 1 Wire Cut EDM

LITERATURE BASED ON VARIOUS MODELING AND OPTIMIZATIONS

The suitable wire electrode material used in wire EDM machining will leads to the improvement of good machining process. In the paper, Experiments have been conducted regarding the choice of suitable wire electrode materials [1]. When the speed of the machining process is high, it may affect the work. The constant measure and correction in different work position relative to the path of motion are made during machining to improve the accuracy of WEDM.[2]

The two models are compared for goodness of fit. The pulse-width, the time between two pulses and the wiretensionare selected as the factors (input parameters),the cutting speed, the surface roughness and the waviness of the surface are the responses (output parameters). The two models are compared for goodness of fit. This leads to the improvement of surface methodology in machining process [3]. For uneven cut to trim cut all the control parameters should be considered simultaneously and analyzed.The various control factor leads to perfect machining especially, in an extremely intricate machining process like Wire-cut EDM. [4]

The characteristic of machining process is determined by using of AISI D5 tool steel. By changing the pressure of the dielectric fluid pressure and also by changing the parameter like circuit voltage and speed of the wire explores the roughness of the surface and metallurgical structure[5]. The amount of real energy required to remove the material from the work piece is defined by specific discharge energy (SDE).Different materials which machined under similar machining conditions results that the relative relationship of specific discharge energy is invariant. The machining parameters obtained from this setting are derived from different materials [6].In wire EDM process for power required for ignition low and for machining its utilize more power .high voltage to sub circuit is required for generating fine surface. Themachine used in this experiment attains the best surface roughness (Ra) about 0.7μm [7].

While machining the Si_3N_4insulating ceramics byWEDM, breakage of wire occurs frequently.to overcome this breakage condition, an advanced electrode material is used. A sheet made up of thin ceramics was hollowed out of Si3N4 ceramics. Also in this paper product can be machined through axisymmetric method by revolving the work piece [8]. To manufacture the micro machine parts a prototype micro wire EDM is generated .the micro wire EDM is completely structured with CNC system.in this micro wire EDM machine, wire transport evenly with constant tension value. The energy discharged is low from power supply system [9]

The cemented carbide work piece is immersed into dielectric of water for a longer period of time. The corrosion takes place on the work piece. Also surface of the work piece (cemented carbide] becomes brittle. The brittleness of the work piece takes place due to binder of cobalt. This paper report about the uses of zinc plate to stop the corrosion of cemented carbide work piece [10]. In this paper closed-loop system is devolved instead of open loop control system.by developing the closed loop system in wire EDM machine, a fine corner cutting is achieved and washout of steep edge measured through the thickness of work piece can be reduced to minimum percentage [11].

Simulation system analyzed the vibration of wire electrode due to the force reacting on the electrode during wire EDM.by knowing parameters such as wire thickness, wire tension and discharge

current, the path of the wire electrode is obtained.so that the simulation method results in corner cut of rough cutting [12]. This paper involves the geometrical study of corner to achieve successive cuts. Controlling the cutting speed leads to amount of material actually removed from the work piece. It also identify the errors in the corner zones. The optimization procedure improves the accuracy of the corners and reduces the error [13].

Through adaptation of the capacitance in parallel with the gap produced in spark, result in shorten of pulse durations of discharge current. The thickness of the recast layer is increased by increasing the peak current along with the pulse on time[14]. This paper involves feed forwardcontroller, which designed to tracking the errors.PMLSM(permanent-magnet- linear synchronous motors)designed to actuate the two degree of freedom controller. The external load disturbance and nonlinear friction are observe by proposed feed forward control structure [15]. This procedure proposed to understand the instability and breakage of wire in wire EDM machine.by comparing the energy discharge, time delay for ignition, and peak current through a set of indicators. The comparison made previously defined threshold values. This results increasing the performance of the WEDM [16].

The movement of the wire is calculated only when the electromagnetic force was applied. The electromagnetic force is attained both by and DC components. The current supplied to the wire through these components.to analyze the electromagnetic force generation, the program derived using a two-dimensional finite element method (FEM)[17]. To enhance the surface quality of work piece in wire EDM. High-frequency power supply is developed. The resistance–capacitance (RC) circuit c is designed with Zenerdiode .controlling the width of pulse result in generating the high frequency [18]. By integrating various process parameters to choose better machining parameters. Selection of best Parameters lead to improve the high material removal rate (MRR) and low kerf. This paper analyzes the important of the feed rate in machining process [19].

Seven different process parameter are investigated including pulse current, pulse width, and tension of the wire. These process parameters experimented on titanium alloy under wire electro-discharge machining to obtain fine work piece[20]. Response surface methodology (RSM) technique is used to study the experimented Al2024 reinforced with SiC composite materials.. Response surface methodology (RSM) is processed to attain low surface roughness and maximum material removal rate [21]. The experiment is carried out underFeCuSn hybrid metal material. Hybrid metal material produces closer net shape of the components. . These materials make stronger affect such as, good wear resistance, corrosion resistance high, and morethermalconductivity. Fine insulation, high-strength material which used in industry likes aerospace, automobiles and manufacturing tools [22].

The study shows mainly, if the micro hardness of the surface is decreased while increasing the hardness of the subsurface.by increasing the pulse duration, the micro hardness of the surface increases. Also the surface crack density is reduced by increasingpulse current and pulse duration [23]. This paper is to analysesthe feasibility of machining the titanium.to machine these type of high strength material in Wire cut Electrical discharge machining is complicated. Involving Response surface methodology (RSM), various process parameters optimized and analyzed to produce better surface

finish and higher metal removal rate [24]. Techniques to determine the waviness (Wa),material removal rates andsurface roughness of wire electrical discharge machining are designed with linear, non-linear and ANN-linear regression modeling. Its evaluated bymean square error, root mean square error and co-relation coefficient .better surface roughness is achieved through linear regression modeling[25]

CONCLUSION

Wire cut EDM process is one of the most non-traditional and advanced process to machine hard cuts and to machine complex shapes which is not possible in traditional machining processes. Wirecut electricaldischarge machine is most efficient method for machining intricate shapes. From this literature, various process parameters are reviewed for effective manufacturing using wire –cut electrical discharge machining.

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